

Steve is a leading international authority on Public Key Infrastructure. He has helped organisations around the world for over 30 years establish effective PKI systems, advising on strategy, policy, architecture, business cases, business process change, technology selection, privacy and governance. He has been intimately involved with pivotal PKI programs including the Australian government's *Gatekeeper* framework, the global financial sector *Identrus*, Medicare Australia's Health eSignature Authority, *WebTrust* for CAs, and the American Bar Association PKI Guidelines. Over 2016-19 he conceived and led the development of a PKI-based verifiable credential wallet for the U.S. Homeland Security. He has been awarded nine PKI patents.

Steve has provided PKI advice to the governments of Australia, Hong Kong, Indonesia, Kazakhstan, Macau, Mongolia, New Zealand and Singapore. He was a senior executive and/or co-founder at the commercial CAs of SecureNet, PwC beTRUSTed, KPMG, and Certificates Australia Pty Ltd (the first Gatekeeper accredited CA).

His technical PKI work covers ISO 18013-5 (mobile driver licences) and IEEE 2030.5 (smart electricity grids). He chaired the OASIS PKI Technical Committee and was an independent member of the Gatekeeper Policy Committee throughout its 12-year existence.

See also www.lockstep.com.au/library/pki.

Technical PKI work

- ***Client Confidential, 2025-26:*** Digital identity subject matter expert supporting the independent development of business strategy and economic model for an ISO 18013-5 based Digital Trust Service for mDL verifiable credentials.
- ***Dept of Climate Change, Energy, Environment and Water, 2025:*** Procurement adviser to the new National Energy Public Key Infrastructure (NEPKI) for authenticating consumer energy resources on the national grid under IEEE 2030.5.
- ***American Association of Motor Vehicle Administrators (AAMVA) 2020-21:*** Member of the advisory board for this peak body's development of an ISO 18013-5 mDL Digital Trust Service and PKI.

Original PKI innovations

- ***Pioneering Verifiable Credentials, 2016-19:*** Lockstep's "[MDAV](#)" wallet developed for the Department of Homeland Security was an early example of cryptographically verifiable credentials, implemented with unusual but still standard X.509 certificates signed under a *decentralised* private root PKI. See *PKI solutions and operations* below.
- ***PKI-based COVID Certificates, 2020-21:*** Conceived an X.509-based "digital yellow book" and published a peer-reviewed paper with the IEEE [7]. Subsequently invited onto the World Health Organisation working group on Digital Documentation of COVID Certificates. See *PKI policy, governance & regulatory work* below.

- **Relationship Certificates, 2005-06:** Developed efficient new certificate ‘push’ distribution models for healthcare professionals, in which certificates represent specific relationships with known communities of customers rather than general purpose identity. Relationship Certificates were first deployed at Medicare where I crafted the key legal interpretation that a digital certificate ‘means nothing more and nothing less than the fact’ that the subscriber has met prescribed registration requirements. This wording has persisted for 20 years in the Certificate Policies of [Medicare Australia](#) and the [National Healthcare Authentication System](#) (NASH).
- **Dun & Bradstreet-KPMG Enshrine, 1999:** Conceived, developed and launched the world’s first corporate certificate verified against securities commission databases; see also *PKI solutions and operations* below.
- **PKI Inventions:** I have been awarded over nine patents for PKI innovations, including:
 - US 10,164,966 *Decoupling identity from devices in the Internet of Things* (2018)
 - US 8,286,865 & 8,608,065 *Authenticating electronic financial transactions* (2014)
 - US 8,347,101 *System and method for anonymously indexing electronic record systems* (2013)
 - AU 2012101460 *Verified anonymous code signing* (2012).

PKI solutions and operations

- **U.S. Dept of Homeland Security “MDAV” 2016-19:** Awarded a three-stage competitive contract with the DHS Science & Technology Directorate to develop [“Mobile Device Attributes Validation”](#), a digital certificate mobile wallet and managed PKI, for an initial use case of first responder credentials. Lockstep is the only Australian company to be awarded a DHS commercialisation contract.
- **National eHealth Transition Authority (NEHTA) 2011-12:** PKI Manager, National Authentication Service for Health (NASH); led the Gatekeeper compliance work stream; wrote the CP/CPS; drafted the risk management strategy for a push distribution model, interfaced to the national health provider registry.
- **Identrus, 2001:** Led the development of the innovative *Starterpak* template system to support fast-tracked managed PKI for this global bank-backed PKI.
- **Cybersign Malaysia, 2001:** Principal consultant working on site (Cyberjaya, Malaysia) in support of this new CA business and operation.
- **PricewaterhouseCoopers beTRUSTed, 1999-2001:** Founding Asia Pacific Director and core team member during the build phase of the world’s most sophisticated managed PKI service; lead author and editor for the beTRUSTed global CP/CPS.
- **Dun & Bradstreet-KPMG Enshrine, 1999:** Conceived, developed and launched the world’s first “evergreen” SSL site certificate, automatically verified against securities commission databases (now the industry standard).
- **Certificates Australia Pty Ltd (CAPL) 1997:** Project manager for the first Gatekeeper accredited CA in Australia.
- **South Australia Department of Health, 2009-11:** Wrote the Certificate Policy and Certification Practice Statements for enterprise-wide PKI services; designed and conducted the Root CA key signing ceremony; liaised with legal counsel on new PKI user terms & conditions.

- **Kazakhstan Ministry of Internal Affairs, 2006:** Feasibility study and build-vs-buy acquisition strategy for the establishment of a national multi-purpose PKI.
- **Westpac, 2007:** Conducted a detailed Gatekeeper gap analysis for the bank's new PKI.
- **Australian Govt Information Management Office (AGIMO) 2005-06:** Principal Consultant on a strategic review of the Gatekeeper PKI governance program; responsible for the new *Relationship Certificate* profile and the "Security Printer" models to dramatically reduce the cost and overhead of Gatekeeper.
- **Medicare Australia Health eSignature Authority (HeSA) 2003-04:** Technical Account Manager overseeing business process reengineering and Gatekeeper re-accreditation after the acquisition of Baltimore Technologies by SecureNet.
- **Australian Tax Office, 2003:** Led the Gatekeeper Environmental Impact Statement for the PKI re-accreditation when the ATO gateway environment was upgraded.

PKI research

- **PricewaterhouseCoopers Cryptographic Centre of Excellence, 2000:** Led the Asia Pacific Chapter of the biggest private sector team of cryptographers in the world.
- **OASIS, 2005:** Researched and developed a new PKI ROI model, featuring a novel digital certificate supply chain model (see [24]).
- **OASIS, 2004 & 2007:** Researched, designed and collated the new [OASIS PKI resources website](#).
- **OASIS, 2005-06:** Designed the 3rd International PKI Survey.
- **Standard Chartered Bank Singapore, 2001:** Led an international survey of digital signature regulations and interoperability with Identrus.

PKI strategy experience

- **World Bank / Government of Mongolia, 2025:** Principal adviser on a strategic roadmap for evaluation of and migration to national decentralised digital identity; led consultative workshops onsite in Ulaanbaatar; wrote the major report including recommendations for public-private partnership development models and implementation roadmap leveraging the established national PKI.
- **Indonesian Ministry of Telecommunications, 2002:** Developed the strategy, business case, operations model and pilot plan for the Indonesian National CA.
- **New Zealand Cabinet, 2000:** Drafted the Cabinet's PKI policy position paper.
- **NEHTA, 2007-08:** Wrote the positive business case for a 600,000 user national PKI for health service providers, the *National Authentication Service for Health* (NASH). Then retained to draft a fast-track procurement strategy (but not subsequently taken up).
- **eASEAN Secretariat, 2004-06:** PKI subject matter expert on a two-year project developing harmonised e-commerce legal infrastructure for 10 S.E. Asian nations.
- **Queralt Inc., 2022-2023:** Product strategy for this early-stage FIDO/PIV PKI middleware solution developer.
- **Healthlink New Zealand, 2018:** Provided a regulatory gap analysis and managed PKI acquisition road map for this multi-national health messaging service provider.

- **South Australia Health, 2008:** Developed a strategic PKI needs analysis and decision-making framework in support of enterprise-wide authentication and identity management reform (see also *Solutions and operations* above).
- **Law Society of NSW, 2005:** PKI subject matter expert consulting on the potential for digital credentials for lawyers.
- **South Australia Department of Administration and Information Services, 2000:** Developed the state's Whole of Government PKI Strategy.
- **NZ State Services Commission, 2001:** Wrote the Offshore CA Accreditation guide.
- **New Zealand Bankers Association, 2000:** Wrote the finance sector PKI strategy.

PKI policy, governance & regulatory work

- **World Health Organisation, 2020-21:** After presenting my “digital yellow book” to the 2020 IEEE International Symposium on Technology and Society [7], I was invited by the WHO to join the Working Group on Digital Documentation of COVID Certificates. My analysis in favour of PKI was reflected in the final [guidelines](#), which deprecate distributed ledger technology for globally scalable verifiable credentials.
- **Hong Kong CA Recognition Office (CARO) 1999:** Led the international team appointed to establish this new regulatory function.
- **Medicare Australia Health eSignature Authority (HeSA) 2005-06:** Developed new ‘push’ distribution models for healthcare professional certificates; drafted Certificate Policies for multiple health sector programs; worked with Medicare legal counsel to develop core liability clauses still in use today.
- **Australian Government Information Management Office (AGIMO), 2005:** Created the new “Relationship Certificate” X.509 profile to represent attribute(s) specific to a community of interest. Relationship Certificates were adopted as a new category in the Australian *Gatekeeper* framework, and implemented in several health & human services programs, including Medicare Australia, Services Australia and NASH.
- **American Association of Motor Vehicle Administrators (AAMVA) 2020-21:** Advisory Board member for this peak body's development of a Mobile Driver Licence based *Digital Trust Service* and PKI.
- **Macau Bureau of Telecommunications Regulation, 2008:** Principal Consultant on the development of a strategic cross-recognition framework for digital certificates, including worldwide survey of e-government applications and state-of-the-art PKI.
- **Singapore National Authentication Framework, 2006:** PKI subject matter expert helping an international team develop a new national identity management service.
- **Hong Kong Post CA, 2001:** PKI business case review.
- **Privacy Commissioner's PKI Reference Group, 2001:** Invited member of a task force to review the privacy provisions in the *Gatekeeper* framework.
- **Certification Forum of Australasia, 1998-2001:** Elected unopposed three years running to chair Australia's peak PKI industry body.
- **National Electronic Authentication Council, 1998-2001:** Founding member of this policy advisory body convened by the Federal Department of Communications.
- **WebTrust for CAs, 2000:** Peer review of the draft international CA assurance scheme on behalf of the Institute of Chartered Accountants Australia.

PKI related Committees

- Data Standards Advisory Committee (2025-now)
- Standards Australia *Cards and personal ID* Committee IT-17 (since 2022)
- Digital Identity Ministerial Advisory Council, NSW (2021-23)
- World Health Organisation Smart Vaccination Certificate Working Group (2021)
- AAMVA Digital Trust Service Advisory Board (2020-21)
- Gatekeeper PKI Policy Committee (2004-16)
- OASIS PKI Adoption Technical Committee (Chair 2007-08; member 2004-08)
- Asia PKI Forum (elected OASIS liaison representative, 2005-08)
- Certification Forum of Australasia (Chair, 1998-2001)
- National Electronic Authentication Council NEAC (1998-2001)
- American Bar Association Information Security Committee (1999-2002)
- APEC e-Authentication Task Group (1998-2001)
- Federal Privacy Commissioner's PKI Reference Group (2001)
- Standards Australia PKAF Committee IT 12-4-1 (1997-2001).

Selected PKI related publications & presentations

- [1]. *Digital ID for Healthcare*, World Bank Pacific Regional Workshop on Digital Identity, Sydney, April 9, 2025
- [2]. [*FIDO and the Future of Australian Digital ID*](#), FIDO Alliance, Melbourne, Feb 7, 2025
- [3]. *Digital Identity and Digital Credentials: It really is WHAT you know not who you know*, Community Care Smart Assistive Technology Collaborative, February 2023
- [4]. *The identity of things? We're gonna need a bigger idea!* FIDO Authenticate, October 2021
- [5]. *A Goldilocks point for Digitised Vaccination Certificates*, Turing Trustworthy Digital Identity conference, London, September 2021
- [6]. [*Why Isn't Identity Easy?*](#) Identiverse (virtual) June 2021
- [7]. [*A digital "Yellow Card" for securely recording vaccinations using Community PKI certificates*](#), IEEE International Symposium on Technology and Society, November 2020
- [8]. *Authenticate the World!* FIDO Authenticate Conference (virtual), November 2020
- [9]. [*A Digital Identity Stack to Improve Privacy in the Internet of Things*](#), S. Wilson, N. Moustafa & E. Sitnikova, IEEE World Forum on IoT, Singapore, 2018
- [10]. [*FIDO Alliance Update: Certification and Disruption*](#), Constellation Research, 2017
- [11]. [*Mobile Device Attributes Validation*](#), Security Cyber Showcase, Washington DC, 2017
- [12]. [*PKI Post Blockchain*](#), Cloud Identity Summit, Chicago, 2017
- [13]. [*FIDO Alliance Update: On Track to a Standard*](#), Constellation Research, 2015
- [14]. [*FIDO Alliance Update: Identity Management Implications for a World of Digital Business*](#), Constellation Research, 2014
- [15]. [*Identity Evolves: Why Federated Identity is easier said than done*](#), AusCERT Security Conference, Gold Coast, 2011
- [16]. [*Anonymity & Pseudonymity in eResearch via smartcards and Public Key Infrastructure*](#), eResearch Australasia conference, Manly (Sydney), 2009

- [17]. [*Public Key Superstructure: It's PKI Jim but Not As We Know It*](#), 7th Symposium on Identity and Trust on the Internet, NIST, Gaithersburg, USA, 2008
- [18]. *An easily validated security model for e-voting based on anonymous public key certificates*, AusCERT2008 Refereed Academic Stream, 2008
- [19]. *Embedded PKI: the emerging state-of-the-art*, 6th Asia PKI Forum International Symposium, Chengdu, China, 2006
- [20]. *A new manifesto for smartcards as national information infrastructure*, 5th Homeland Security Conference, Canberra, 2006
- [21]. *Smartcards and PKI at Medicare Australia*, Brewer, J. & Wilson, S., Australian Electrical & Electronic Manufacturers Association ICT Forums, 2006
- [22]. [*The importance of PKI today*](#), China Communications, December 2005
- [23]. *Relationship Certificates for Known Customers - a new PKI paradigm*, 5th Asia PKI Forum International Symposium, Beijing, 2005
- [24]. [*Guidelines on how to determine Return on Investment in PKI*](#), OASIS, 2005
- [25]. *A novel application of PKI smartcards to anonymise Health Identifiers* AusCERT2005 Refereed Academic Stream, Gold Coast, 2005
- [26]. [*Patient Privacy and Security – Not a zero sum game!*](#) Wilson, Connolly and Denney-Wilson, Journal of the Australian Epidemiology Association, V12.1, 2005
- [27]. *A summary of PKI data for Australia*, Asia PKI Forum, Tokyo, Feb 2005
- [28]. *PKI lessons from Australia*, Global e-Business Forum, Geneva, 2003
- [29]. [*Rethinking PKI – the electronic business card*](#), Secure Computing Magazine, June 2003
- [30]. *PKI without Tears*, American Bar Association eBlast, V1.1, January 2003
- [31]. *Demystifying international cross-recognition of PKI: we've been barking up the wrong tree* International Security Solutions Europe (ISSE), London, 2001
- [32]. *Comparison of Authentication Technologies*, Asia Business Law Review, No. 33, 2001
- [33]. *Leveraging external accreditation to achieve PKI cross-recognition*, Attorney Generals Privacy & Security conference, Melbourne, 2001
- [34]. *PKI and the Acceleration of B2B*, European-American Business Journal, Spring 2001
- [35]. *Will Biometrics Obsolete PKI?* ABA Bulletin of Law, Science & Tech, 2001
- [36]. *Audit based public key infrastructure*, Certification Forum of Australia, Nov 2000
- [37]. *Attribute Certificates and their Limitations*, Journal of the PricewaterhouseCoopers Cryptographic Centre of Excellence, Issue 3, 2000
- [38]. [*New models for the management of public key infrastructure and root certification authorities*](#), 7th IFIP Conference on Info Security, Amsterdam, 1999
- [39]. [*Privacy positive aspects of public key infrastructures*](#), Privacy Law & Policy Reporter, Vol 5.10, 1999
- [40]. [*Some limitations of web of trust models*](#) Information Management & Computer Security, Vol. 6, No. 5, 1998 (Highly Commended Award, MCB University Press).